Acta Scientific Pharmaceutical Sciences

Volume 2 Issue 3 March 2018

Mini Review

Clinical Bioinformatics: Linking Pharmacogenomics with Informatics

Nida Tabassum Khan*

Department of Biotechnology, Faculty of Life Sciences and Informatics, Balochistan University of Information Technology Engineering and Management Sciences (BUITEMS), Quetta, Pakistan

***Corresponding Author:** Nida Tabassum Khan, Department of Biotechnology, Faculty of Life Sciences and Informatics, Balochistan University of Information Technology Engineering and Management Sciences (BUITEMS), Quetta, Pakistan.

Received: December 24, 2017; **Published:** February 27, 2018

Abstract

Pharmacogenomics focuses on personalized medicine to identify for individuals differences in disease diagnosis, experience, and therapy response. Integration of bioinformatics in pharmacogenomics offers reduction in healthcare costs by improving our ability to quickly and reliably select effective therapy for a given patient while minimizing costs associated with ineffective treatment and avoidable adverse events.

Keywords: String; Abalone; InPrePPI; CFinder; MCODE

Introduction

With the advancements in the field of clinical chemistry, biochemistry and microscopy, personalized medicine is becoming more and more popular, linking health with genes. Thus by documenting and probing people's family health histories for a diseases, genetic source is identified for the successive progeny [1,2]. With the passage of time valuable genomic data escalated identifying sets of genes that are involved in a disease among people of different ages, backgrounds and cultures [3]. Personalized medicine is recommending the drug based on an individual genomics.it is often considered as custom made drug based on individual characteristics, essentials and preferences [4,5]. Because a disease onset, prognosis and response to a drug varies from individual to individual [6]. Genomic information plays an important role in personalized medicine. DNA-based technologies such as SNP genotyping, haplotype mapping or gene sequencing helps in identifying disease vulnerability and risk in an individual at birth [7,8]. Besides mRNAs and microRNAs profiling, molecular interactions, modelling and simulation provides a more precise means to understand the underlying disease mechanism [9]. It also helps in disease diagnosis and based on patient's genetic makeup therapy is recommended [10,11].

Given below is a list of some bioinformatic tools and databases that is help full in pharmacogenomics table 1.

SMART	Provides functional information about the protein [12]
AutoDock	For the prediction of protein complexes interaction [13]
HADDOCK	Predicts modelling and interaction of molecular complexes [14]
BIND	Bio complexes molecular interaction database [15]
MOE	An integrated software for modelling, visualization and drug designing [16]
STRING	An extensive database on molecular interactions [17]
MIMO	Comparison tool for the biological pathways [18]
IntAct	Tools for molecular interaction data analysis [19]
Graemlin	Used for scalable multiple network alignment [20]
Path BLAST	Search molecular interactions [21]
CFinder	For finding and visualizing the nodes [22]
MINT	Database, on functional interactions of biological molecules [23]
Gene Quiz	To search for altered patterns in the given data [24]
ClustalW	Gene or protein sequences comparison tool [25]
Abalone	Molecular modelling simulations of biological molecules [26]
Ascalaph	Molecular modelling tool [27]
Discovery studio	Modelling and simulation tool [28]
Amber	Biomolecules molecular dynamics simulation tool [29]
FoldX	To estimate molecular stability of either single protein or complexes [30]
Potential Drug Target Database	Database of drug targets [31]
MEGA	Phylogenetic tree construction tool [32]

MOLPHY /PAML	Phylogenetic analysis tool based on maximum likelihood method [33,34]
JStree	Phylogenetic trees viewing and editing tool [35]
TreeView	Phylogenetic trees viewing tool [36]
Jalview	Alignment editor tool [37]
STITCH	Database about metabolic pathways and molecular [38]
SuperTarget	Database that contains drug-target relations [39]
SNPdetector	Tool for sensitive SNP detection [40]
SNPHunter	Tool for SNP screening, selection, and acquisition [41]
Survival GWAS_SV	Software to handle large scale genome-wide data [42]
TissGDB	Tissue-specific gene annotation database [43]
scRNASeqDB	Gene expression profiling database in humans based on RNA sequence[44]
Cancer cell metabolism gene database	Database of cancer cell metabolism genes [45]
Tumor suppressor gene database	Tumor suppressor genes database [46]
PAHKB	Pulmonary Arterial Hypertension Knowledge Base [47]
Virus Finder	Find viruses and their integration sites in host DNA [48]
CNV annotator	For copy number variation (CNV) determination in humans [49]
VarWalker	Analysis of putative cancer [50]
NGS Catalog	Next generation sequencing databases in humans [51]
GenRev	Tool for extraction of subnetwork [52]
glad	Tool for gene length bias detection [53]
InPrePPI	Tool for the prediction of protein-protein interactions (PPIs) [54]
SNPKS	To find the SNP size in vertebrate genomes [55]
PharmGKB	Tools to track associations between genes and drugs [56]
SIDER 2	Contains information on marketed medicines and their recorded adverse drug reactions [57]
Comparative Toxicogenomics Database	Contain data on biological interactions and its associations with diseases [58]
Genomics of Drug sensitivity in cancer database	Data on the relationship between tumour cell genomics and sensitivity to anti-cancer agents [59]

Table 1: List of bioinformatic tools and databases in pharmacogenomics.

Conclusion

Pharmacogenomics and bioinformatics, together paved the pathway for personalized medicine to be introduced as an effective therapy for individuals based on their genome. Pharmacogenomics provides information related to an individual's response to a drug based on their genetics. This information is valuable in designing novel drugs and vaccines. Though, both of these disciplines are still in infancy and currently facing hurdles but holds immense potential to revolutionize the coming era of medicine.

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